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ECONOMIC

U.S.-JAPAN TRADE RELATIONS, ECONOMIC RECOVERY STUDIED

Tokyo WAGAKUNI SANGYO NO KYORYOKU NI YORU BEIKOKU SANGYO KASSEI-KA in Japanese Sep 81 pp iii-v, 1-10, 25-26, 52, 54, 173-178

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Chapter I. (Section 1)

1. Summary of Research Results

(1) Outline of Research

As a result of modernization and rationalization efforts made in the 1970's, Japanese industry (limited to manufacturing industry here) has now surpassed the United States in many important industrial categories. And, due to the increased exports to the United States, a large trade imbalance has resulted between the United States and Japan, at the same time causing trade frictions one after another in the categories of iron and steel, color television, and automobiles. Naturally, the United States still has some strong industries and Japan has some weak industries, but trade friction has occurred in industries where Japan has a comparative advantage.

In the United States, the economic recovery policy of the Reagan administration is in progress, and the confidence of industrial circles has been greatly improved compared to previous years. However, the success or failure of this historical experiment, which may be compared to the New Deal, is difficult to foresee, and it will take some time before definite effects of the policy are manifested. Consequently, in the 1980's, especially in the first half, the Japanese comparative advantage and competitive edge in certain industrial categories are not expected to change much, and Japan will continue to maintain a strong stand against the United States. Furthermore, the U.S.-Japan trade friction may not be limited to basic, mature industrial areas such as iron and steel, automobiles, etc, but possibly will extend to high technology industries.

Japan's increased exports to the United States, along with the U.S. demand for an open market in Japan, has caused frequent tension in U.S.-Japan economic relations. With the Reagan administration, opposition between the U.S. and Japanese policies also includes defense problem. This is closely related to the fact that Japan has surpassed the United States and become a strong economic giant.

The U.S.-Japan trade frictions which occurred one after another were due partly to the fact that the productivity of Japanese industry rose rapidly, whereas the productivity of U.S. industry stagnated, resulting in a productivity gap between the United States and Japan in many manufacturing fields. It is not a problem that can be solved by measures such as temporary voluntary regulation of exports. The only path to the solution of U.S.-Japan trade friction is for the United States itself to take serious measures toward industrial recovery and revitalization, and for Japan to cooperate in this industrial recovery and revitalization, and for Japan to cooperate in this industrial recovery by such means as direct investment, technological transfer, etc. It would be possible, in this manner, to reconstruct the weakened sectors of the U.S. industry and to stimulate the development of sectors with future growth potential.

The United States and Japan have maintained a very close, mutually dependent relationship in economic and many other aspects since World War II, and it is necessary to continue this relationship in the future as well. In this respect, Japan has no other choice. The U.S.-Japan trade friction resulted from the deepening mutual interdependence. Consequently, the countermeasure is not to weaken the mutual interdependence by protectionism, but to minimize frictions through Japan's cooperation in U.S. industrial recovery.

Naturally, the basic relationship in which the United States and Japan compete as the number one and number two economic giants in the free world will not change. Therefore, there cannot be a situation in which absolutely no friction exists between the United States and Japan. Although the United States and Japan continue to compete at all times, it is necessary, on the other hand, to cooperate and help U.S. industry in those sectors where Japan has an advantage. In order to prevent protectionism from spreading and the free trade system from being reduced to existing in name only, the country having the advantage must support the country in trouble.

Based on such viewpoints, this study is focused on the following points.

--Why did the productivity of U.S. industry (limited to manufacturing industry) become stagnant and lose the international competitive edge?

--Why did Japanese manufacturing industry in many sectors grow and succeed in increased productivity and come to have a strong competitive edge?

--What would be the result of a comparison of the levels of productivity in the United States and Japan?

--What measures should the United States take in order to revitalize U.S. industry?

--What industrial cooperation should Japan provide for U.S. industrial recovery? What would be the effects and limitations?

Since the focus is on the problem of U.S.-Japan trade frictions, the target of this study is not on all industries, but on manufacturing areas where friction has already developed or is likely to develop in the future. Consequently, the study excluded high technology industries such as aerospace and agriculture, where the United States still has the comparative advantage, and service industries such as communications. For this reason, the study focused on the current status of and desirable industrial cooperation in mature industries, such as iron and steel, automobiles, etc, where Japan has a strong competitive edge, and in the electronics industry (semiconductors, computers, etc), where Japan is expected to outdo the United States in the future.

In addition, the topic of so-called Japanese style management was chosen as an important theme in this study, and its effect on productivity, it applicability to other countries, and the difficulties were studied. To this end, to comparative studies were made by conducting various surveys regarding the status of Japanese firms, U.S. firms, Japanese firms in the United States, and U.S. firms in Japan. This portion appears in the latter half of the report (Chapters V-VII).

Based on the results of these quantitative analyses, industrial analyses, and field surveys, conclusions were made drawn following discussion by the research committee.

(2) Summary of Research Results

Summaries were made according to the order of the chapters in the report.

Factors Contributing to the U.S. Industrial Stagnation (Chapter II, Section 1)

The United States has the world's highest productivity in such technology-intensive manufacturing industries as agriculture, computers, aircraft, etc, and service industries such as communications. However, viewed from an overall standpoint, the rise in productivity became stagnant starting about the mid-1960's, and it decreased in 1978-80, with an especially marked decline in the mature industries. As a result of stagnant production and productivity, the U.S. position in the world economy declined although it was still at the top. In 1978, the per capita GNP was surpassed by West Germany, and it was closely followed by Japan.

The causes lay in the intricately intertwined overall U.S. socioeconomic system encompassing production, marketing, social environment, etc. In the area of production, one can point out stagnation of investment in plant and equipment accompanied by a deterioration (obsolescence) of capital quality, ongoing substitution of machines for humans, decline in capital utilization efficiency, stagnation of technological development, management policy aimed at short-term return on investment, reduced corporate competition, the manifestation of problems inherent in conventional U.S. management systems, hostile labor-management relations, a decline in labor quality due to a rapid increase in the number of young and woman laborers, etc.

From the viewpoint of marketing, outstanding problems include the supply-demand structure in which priority is given to consumption over investment, neglected export efforts, an overall slowdown in growth, etc.

Looking at the industrial environment, first, government policies that inhibited productivity include failure to suppress inflation in the 1970's, expansion of government, excessive increase in government regulations, protectionist import restrictions, etc. In U.S. society and culture, many deep-rooted problems exist such as a decline in the work ethic due to a change in the individual value system and an excessive welfare society, a deterioration of law and order in the society as seen in increased crime, a decline in the quality of education, etc.

These intricately intertwined factors have inhibited the increase of U.S. productivity. It is essential to fully recognize these problems.

Countermeasures for Industrial Recovery (Chapter II, Sections 2, 3)

In order to break through such stagnation and revitalize U.S. industry, it is necessary to improve the quality of capital expenditure by promoting investment in plant and equipment, promote technological development, upgrade management quality (long-term management strategy, management revolution), improve labor-management relations, and improve the work quality (upgrading of ability and work motivation). Government policies should be aimed at inflation control and easing of excessive regulations, and industrial policies should be aimed at promoting growth of new industries and readjustment of lagging industries. In addition, it is necessary to take such social measures as restoring social order, promoting the value system, upgrading education and raising the levels of minority groups. Since the causes of industrial stagnation are extremely widespread and complex, the countermeasures must also extend over various areas and be comprehensive.

The Reagan policy is a new experiment based on a new theory called supply-side economics. Its basis is a drastic cutback in government spending, a consumer tax-cut, a corporate tax-cut through accelerated depreciation, control of the currency supply, and relaxation of governmental regulations. However, there are various theoretical and practical problems, and the success or failure of this experiment cannot be evaluated at the present stage. The effects on the control of inflation and promotion of investment in plant and equipment are expected first, but this will require a considerable time. And the Reagan policies are not all that are required as industrial recovery policies. An improvement in management and work quality, improvement of labor-management relations, etc, are problems that should be undertaken by the private sector.

Comparison of Industries in the United States and Japan (Chapter III)

In Japanese industry, heavy chemical industrialization was promoted in the 1960's, technology-intensive industries such as electric and electronic machinery grew in the 1970's, and efficiency was promoted by overcoming the shock of the oil crisis. As a result, a strong competitive edge developed for exports in iron and steel, color television, automobiles, etc, which have an advantage over the United States in productivity and product quality. The current comparative advantages in U.S.-Japan trade are that Japan is stronger than the United States in engineering products such as various types of machinery, and the United States is stronger than Japan in primary products and some high technology engineering products (such as aircraft). The drastic increase in the international competitive edge of Japanese industry in the 1970's was due to the marked upgrading of labor productivity by modernization of plant and equipment (upgrading of capital quality), improvement of production technology, Japanese style management, high quality labor force, etc. (Chapter III, Section 1)

As we compare the level of labor productivity of the manufacturing industries in Japan and the United States (monetary production base), Japan surpassed the United States in the early 1970's in iron and steel, and in 1977 it outdid the United States in electric machinery for public use, transportation machinery excluding automobiles, and semiconductors. In addition, if we estimate the productivity levels in 1980, Japan has apparently surpassed the United States in general machinery, communications machinery (including television), automobiles, and precision machinery. However, there are still many industries where the United States is in an advantageous position, such as computers, aircraft, space industry, biotechnology, etc. (Chapter III, Section 2)

As we study the mature industries where trade friction developed, there is a big difference in the case of iron and steel, where an obsolete, lagging state exists in the United States compared to the new facilities and the newest iron manufacturing technology in Japan, and Japan is overwhelmingly ahead. In the case of automobiles, the United States fell behind in energy-saving compact cars, resulting in the advantage going to Japanese cars, but the fact that the Japanese cars excelled in quality over the U.S. cars had a great influence also. Regarding the iron and steel and automobile industries, Japan surpassed the United States in 1980 not only in productivity but also in output for the first time in history (number of cars produced). However, 1980 was a year of contrasts in which the United States experienced a recession and Japan experienced steady growth.

On the other hand, when we study the semiconductor and computer industry as a representative growth industry, the United States has the advantage over Japan. However, the Japanese industry is catching up fast, and vigorous U.S.-Japan competition is expected in the 1980's. Unless proper measures are taken, there is the possibility that the friction will spread to this field as well (Chapter III, Section 3).

Japanese Industrial Cooperation With the United States (Chapter IV)

Although Japan stands in an advantageous position compared to the United States only in some important manufacturing industries, if the U.S. industrial recovery takes time and if the trade frictions are ignored and thus perpetuated, there is the danger that the United States will retrogress even more into protectionism. In order to avoid the dangerous course of a U.S.-Japan head-on collision, there is no other way for Japan but to cooperate in the U.S. industrial recovery; it is the only desirable path to take in the 1980's.

The following table summarizes the desirable ways for industrial cooperation with the United States.

Desirable ways for Japanese industrial cooperation with the United States.

Direct Investment

1. Direct investment and local production in the United States by Japanese firms.
2. Promotion of the ongoing U.S. production ratio of Japanese firms.
3. Investing in stocks of U.S. firms (investment in related firms).
4. Joint undertaking of U.S.-Japanese corporations.
5. Joint production of U.S.-Japanese corporations.

Technological Transfer

Hard Technology:

1. Transfer (licensing, etc) of superior Japanese R&D, design, and production technology to U.S. firms.
2. Modernization of plant and equipment of U.S. firms by Japanese technology.
3. Supply production technology for high productivity and high quality.

Soft Technology:

1. Supply of knowhow for transplanting Japanese style management to U.S. society and culture.
2. In particular, development and supply of knowhow for the practice of subgroup activities such as QC circles in the United States.
3. Advice on improvement of labor-management relations.

Trade

1. Temporary export restraint.
2. Promotion of imports from the United States, market development in the United States, and international division of labor.
3. Supply of knowhow by general trading firms for trade expansion.

R&D

1. Collaborative research and development in energy conservation, substitute energy, etc.
2. Research cooperation, joint development in leading technology (electronics, etc).

(See Chapter IV, Table 4-1-2)

First of all, regarding trade restraint is in effect. However, this does not necessarily improve the current status of the iron and steel and automobile industries. The gap between the United States and Japan in their productivity and competitive edge is wide, and if ignored, there is the danger that the

United States will take severe protectionistic measures due to increasing unemployment. Export restraint is being carried out as a "temporary, exceptional measure" to prevent this from happening. However, when such a measure is prolonged, it rather inhibits U.S. industrial recovery. As the treaty expires, it is essential for industrial recovery that the United States totally return to a free trade system.

While export restraint constitutes negative cooperation, direct investment (local production) and technical transfer are positive cooperation, and they are beginning to demonstrate their effectiveness in U.S. industrial revitalization. The U.S. color television industry, which escaped into protectionism in the latter half of the 1970's, is now regaining its vitality. Production by Japanese manufacturers in the United States exceeds 30 percent of U.S. color television production, exports from Japan have been reduced, and trade friction has disappeared. On the other hand, the automobile industry venture in the United States involves far greater difficulty than the color television industry, but factories for two corporations are under construction in the United States.

In the area of growth industries, the United States and Japan have already entered into an era of vigorous competition. With semiconductors, the United States and Japan are aiming at resolving friction by respective ventures (mutual direct investment) in the other country.

In the case of iron and steel, modernization of the U.S. iron and steel industry is beginning to make progress, in part by the transfer of Japanese advanced technology to the United States. In other industries, too, technological exports to the United States are beginning to increase in the industrial categories where Japan has caught up with and surpassed the United States.

In addition, in the case of U.S. corporations that have noted the close relationship between the high productivity of Japanese industries and the Japanese management system, enthusiasm to learn Japanese style management as a soft technology is increasing. A particularly conspicuous case is the corporation that is trying to import TQC (Total quality control), including QC circles, from Japan. Furthermore, the awareness that cooperative labor-management relations such as those formed in Japan are necessary for industrial reconstruction has been gradually gaining strength in the United States as well. Although it is not always easy to transfer such Japanese-style knowhow, it is very effective for Japan to extend such cooperation.

In the trade aspect, efforts should be made to promote imports from the United States and to have an international division of labor. It is also beneficial to supply the United States with knowhow for market development and export expansion.

Furthermore, regarding the leading technology projects in which the future technological development cost will be very high and which will encounter many technical difficulties, joint research and development by the United States and Japan (also including Europe) are desirable for the long-term industrial cooperation of the two countries.

Through such diverse industrial cooperation on the part of Japan and self-help on the part of the United States, the two countries will enter a new relationship in which they cooperate while competing.

However, Japanese industrial cooperation involves various problems and limitations. To substitute production in the United States for exports to the United States will certainly increase production and employment in the United States and bring about an improved balance of trade, but it will have a more or less negative effect on Japan (the impact will be especially great in the case of the automobile industry venture in the United States). In addition, even though the United States presents little country risk, the market competition is vigorous and the investment risk is great. The cost of investment in a large-scale production facility as in the case of automobiles is very high. However strong it may have become, there is a limit to the investment capability of Japanese corporations.

At the same time, Japan has received strong requests from various European countries for similar industrial cooperation. In addition, economic and technological cooperation with developing countries, including China, must be increased. While the need for industrial cooperation is limitless, the Japanese capability for industrial cooperation is limited. As a consequence, it has become necessary for Japan, as a nation and as an enterprise, to have a long-term strategy and plans as to how the global distribution is to be made within the limited capability for industrial cooperation.

The outline for industrial cooperation with the United States has been described above. Focusing on one part, soft technology, especially Japanese style management, studies were made as to effect is present, what problems are involved in conventional U.S. management, what difficulties may be encountered for a foreign country to learn Japanese style management, and what U.S. corporations should do to overcome those difficulties.

Universality of Japanese Style Management (Chapter V)

At present, enthusiasm is found in some U.S. corporations, labor unions, and academic circles for learning Japanese style management. By reversing the statement, it can be said that there is disappointment with the achievements of conventional U.S. management, and a model escape measure is being sought in Japanese style management.

Taylorism in factories, an impersonal, bureaucratic corporate system, decision-making from the top down, etc, are characteristic of U.S. style management aimed at efficient management. This way of thinking treats laborers not as human beings but as mechanical equipment, which was at one time modernistic and rationalistic in its own way. However, today, such management causes alienation of the laborers, lowers work motivation, and has become a big factor in lowering productivity and product quality (Chapter V, Section 1).

A reconsideration of such U.S. style management has been underway for some time, and various studies and countermeasures have been proposed. However, for a long time they were not reflected in actual management in the United States, and new attempts fell through one after another (Chapter V, Section 2).

After such history, experiments in what is called quality of work life (QWL) are being conducted today in the United States by GM and other corporations, and its effectiveness has been demonstrated in the upgrading of work motivation and improvement of productivity and quality. The number of corporations adopting such QWL has steadily increased recently. The intrinsic nature of QWL is to treat laborers as human beings and attempt to encourage them to "participate" in decisionmaking at the work site level by forming subgroups which resemble the Japanese QC circles. It has an element that is common to Japanese style management where the participation of employees from the bottom up is being practiced (Chapter V, Section 3).

The Japanese style management which was formulated after World War II, particularly in the high growth period, is characterized by lifetime employment, a seniority system, combined to-down and bottom-up collective decisionmaking, labor-management cooperation, etc. It may be said that what lies at the basis is the "collectivistic" value system that seeks "respect for the human being" and a harmony between individual and collective profits (Chapter V, Section 4).

Japanese style management originated in the old Japanese family system or paternalism, but today it has been transformed into a modernistic, reationalistic management concept. There are universal elements in the management style that other countries can learn regardless of social and cultural differences. They include respect for the human being, collective decisionmaking--that is, participation--and humanization of work--that is, overcoming alienation of laborers. These are attributes similar to those found in QWL (Chapter V, Section 5).

A comparative survey of awareness was conducted between Japanese laborers working under Japanese style management and American laborers working under U.S. style management. In addition, a comparison was also made with American laborers of Japanese corporations in the United States working under Japanese style management. According to the results, there was very strong support for lifetime employment among American laborers (blue collar workers) (at the time of the survey, numerous layoffs were underway in the U.S. automobile industry, and the feeling of insecurity among the laborers was strong). However, there was much opposition to seniority-based wages. In this respect, they were similar to British laborers. Contentment at work and awareness of belonging to the company were high both in the United States and Japan (Chapter V, Section 6).

However, regarding the "participation" of laborers at the work site level and trust in managerial executives, a far superior mark goes to Japan. The same is true with Japanese corporations in the United States. Japanese laborers have a strong awareness "not to produce defective products at all," whereas Americans do not feel this as strongly. In conclusion, it is obvious that the "participation awareness" of the Japanese increases the trust in the system and the motivation to improve quality.

Japanese Experience and Applicability to the United States (Chapter VI)

As one of the secrets of the development of Japanese industry, a cooperative structure between the government and the private sector is frequently pointed out. The role of the Japanese Government has changed greatly on the basis of the developmental stage of industry, and today, "Japan, Incorporated" has already become a myth. However, in bringing out the vitality of private industry, industrial policies played a big role. And Japanese economic policy has been consistently for supply-side economics.

Japanese industrial policy was not very effective for the reconstruction of relatively disadvantaged industries (textile, etc), but it did succeed in forming a vision for growth industries and the induction of private industries. In the United States, opposition to industrial policy is strong to begin with, but to have a long-term vision for industry that agrees with U.S. national circumstances would be advantageous for industrial recovery (Chapter VI, Section 1).

Investment and production of Japanese corporations in the United States have rapidly increased in recent years. However, when we study the actual state of these Japanese firms, productivity and product quality are not up to those "made in Japan," even with the same production facility as the Japanese factories. However, compared to competing U.S. manufacturers, they are superior. Since the quality of the labor force of Japanese firms in the United States is the same as that of U.S. firms, the reasons for the superiority of the Japanese firms are believed to be production facility, Japanese style management and quality control techniques, high quality parts, etc. For this reason most of the Japanese firms in the United States have been successful, and many of them are expanding their facilities. However, there are also considerable risks (Chapter VI, Section 2).

On the other hand, the U.S. multinational enterprise ventures in Japan have achieved high performances both in productivity and product quality by using a high-quality labor force and technicians and by incorporating Japanese style management and quality control. An increasing number of multinational enterprises are reporting that their Japanese factories are tops among their factories worldwide. For this reason, investment in Japan by growth industries such as semiconductors and computers is rapidly increasing (Chapter VI, Section 3).

The U.S. corporations that have introduced Japanese QC circle activities now number over 200, and enormous enthusiasm is encountered. When we observe the examples, clear improvements in quality are found in factories practicing QC circle or subgroup activities such as QWL, thus demonstrating a considerable effect. However, it is not easy to make a QC circle successful in a culture different from that of Japan, and its introduction requires considerable ingenuity and demands a management revolution (Chapter VI, Section 4).

To be sure, Japanese style management was formulated in the unique Japanese society and culture. However, it resembles (though not identical with) successful U.S. corporations such as IBM and Texas Instruments with respect to job security, development of employee abilities through long-term education, participatory decisionmaking, long-term management strategy, etc. This is a proven example of the universality of Japanese style management. When foreign countries learn Japanese style management, there must be modifications to adapt it to that country. On the other hand, there are limitations. For example, blue collar workers accept Japanese style management, while white collar workers accept it with difficulty; or it works in a growth industry, but many difficulties arise in the case of mature industries, etc. (Chapter VI, Section 5).

Japan as a Model for U.S. Industrial Revitalization (Chapter VII)

This chapter contains comments on Japanese style management by foreign scholars. There is reason to believe that the high productivity of Japanese industry is related to Japanese style management. Although it may be possible for foreign countries to learn the "technique" of Japanese style management, it is difficult to transfer the Japanese style "value system" that lies behind it. However, Japanese style management can be effective at the blue collar level, and if the Japanese style management technique is modified and adapted, it may be applicable in foreign countries as well.

Chapter II. [Section 1]

(3) Analysis of Factors Leading to Productivity Stagnation

Factors believed to be the cause of stagnant U.S. productivity since the latter half of the 1960's were classified into three areas--production element, market, and environment--and the results were summarized and are shown in Table 2-1-5. These factors are intricately interrelated in actuality, but the table shows the classifications without that consideration.

For example, a stagnation in corporate investment in plant and equipment (1-1-1) is frequently pointed out as the culprit for stagnant productivity of U.S. industry. However, it is related to all of the following: stagnation of technological innovation (1-2-1), stagnation of R&D expenditure (1-2-2), management policy to pursue short-term return on investment (1-3-1), labor-management relations, increase in the size of the young and female labor force and a relative decrease in the labor cost (1-4-1), and government policies that failed to control inflation and increased government regulations (3-1).

A decrease in productivity raises labor costs and becomes a cause for severe inflation. On the other hand, inflation causes a shortage in corporate depreciation, increases taxation on the inventory profit, and reduces investment in plant and equipment due to increased economic uncertainty, resulting in stagnation of productivity as a consequence.

Similarly, a decline in the work ethic of laborers (1-4-2) is related to the conventional U.S. management system (1-3-3), namely, a pyramid-shaped bureaucratic system, decisionmaking from the top down, and problems stemming from the Taylor system; and it is deeply affected by changes in the value system of the American people (3-2-1), exhaustion of the social security system, especially unemployment insurance and pensions (3-2-3), as well as an unequal class society (3-3-3).

Table 2-1-5 Summary of factors contributing to the stagnation of U.S. productivity.

Area		Problems
1 Production elements	1-1 Capital	1. Stagnation in equipment investment and deterioration of capital quality (obsolescence) 2. Increased investment in nonproductive facility 3. Decreased efficiency of capital utilization
	1-2 Technology	(Hard technology) 1. Stagnation of technological innovation 2. Stagnation of research and development (R&D) expenditure
		1. Management policy in pursuit of short-term return on investment (ROI) (deterioration of management quality) 2. Reduced intercorporate competition (mature industry) (Soft technology) 3. Conventional management system* 4. Labor-management relations*
	1-4 Labor force	1. Increase in the young and female labor force (relative cost reduction) 2. Quality of labor force (decline in mean scholastic attainment, level of skills, and work ethic) 3. Labor-management relations*
	1-5 Natural resources	1. Depletion of domestic resources*° 2. Rising cost of import resources
2 Market	2-1 Domestic market	1. Slowed down growth (deteriorated economy of scale)* 2. Demand structure of consumption priority over investment 3. Relative increase of service industry sector°
	2-2 Overseas market	1. Negligence of export market* 2. Export-inhibiting systems, regulations, and policies
3 Environment	3-1 Government policies	1. Failure of inflation control policy 2. Enlargement of government sector (big government) 3. Taxation system inhibiting savings and investment 4. Excessive government regulations 5. Opposition between government and industry 6. Protectionist import restrictions
	3-2 Culture	1. Change in individual value system associated with higher education in "affluent society"° 2. Breakdown of conventional rules and order after Vietnam war (deteriorated environment quality)° 3. Deterioration of work ethic due to exhaustion of social security system (overextended welfare society)

[table continued]

[continuation of Table 2-1-5]

Area	Problems
3-3 Society	1. Me-ism (excessive individualism, increased opposition)*
	2. Social opposition
	3. Unequal class society (decline in upward mobility)*

* Long-term structural factors that came to inhibit productivity by combining with other factors since the latter half of the 1960's.

° Factors that are difficult or impossible to change (recovery).

Chapter II. [Section 2]

(2) What Should Be Done by the United States

Comprehensive measures compiled on the basis of such a viewpoint are shown in Table 2-2-1. This table corresponds to Table 2-1-5 where factors leading to stagnation of productivity were summarized. Here, goals are indicated for each problem are, and the means for achieving the goals, i.e., countermeasures, have been divided into the main constituents--government, corporations, labor, and society. If area-specific countermeasures by constituents are taken systematically, the U.S. socioeconomic system will be revitalized as a whole and their synergistic effect will be enlarged. This is the reason why the comprehensive measures are emphasized. The factors with the highest priority among them are as follows:

1) Improvement of capital quality (increased investment in plant and equipment = raising the capital-labor ratio) and development of new technology

2) Improvement of management quality (long-term management strategy, revolution of conventional management, promotion of competition)

3) Improvement of labor-management relations (labor-management cooperation)

4) Improvement of labor force quality (education, substantial training, improved work ethic)

5) Improvement of government policies (inflation control, etc)

6) Formation of social consensus, creation of new community awareness

Table 2-2-1 Summary of Countermeasures for Revitalization of U.S. Industry

Area	Goals	Means (countermeasures) for achieving the goals			
		Government	Corporations	Labor	Society
1-1 Capital	Improvement of capital (facility) quality	*Tax cut, relaxation of regulations	Increase investment in new facilities	Cooperate toward modernization of plant and equipment	
1-2 Technology	Promotion of technological development	Financial and tax measures for R&D promotion	Increase investment in R&D		
1-3 Management	Upgrading of management quality		Long-term managyment strategy; management revolution; promotion of intercorporate competition	Participation and commitment	
1-4 Labor	Improvement of labor-management relations;	Qualitative improvement of education	Cooperative and harmonious labor-management structure		Consensus formation
	Improvement of quality of labor force		Enrich education and training	Upgrade work ethic; reduce rate of absenteeism and quitting	
3-1 Government polies	(policy improvement--rational intervention policy) Control inflation; promote savings and investment	*Cut back government spending; stabilize financial policy *Tax cut, tax reform	Increase supply and competition	Control wage increases	Increase savings
	Correct excessive industrial regulations	*Relaxation of regulations			
	Rearing of new industry & industrial adjustment	Industrial policy avoid protectionism	Prevent protectionism; invest in new industry		
	Cooperation between government and private sector	Harmonize with industry and labor			Consensus formation
3-2 Culture	Cooperative value system new community awareness				Consensus formation
3-3 Society	Recovery of social order upgrading of education; minority measures				Consensus formation Enrich education; substantial equalization

*mark indicates policies of Reagan administration.

4. Structure of Japanese Style Management

(1) History of Japanese Style Management

In this section, an overview of the origin and structure of Japanese style management is presented. With respect to the origin, a time division may be made between the stage of establishment during the prewar period and the stage of reorganization during the postwar period.

Prewar Japanese style management is commonly called the "managerial family system." The most systematic and comprehensive valid studies have been made on this subject by H. Hazama. We shall therefore present an overview based mainly on Hazama.[1]

The managerial family system is a direct manifestation of the traditional management of merchants from the Edo period and of shogunate/feudal clan-operated manufacturing, with the form being changed according to the demands of the time. In other words, management in the post-Meiji Restoration Era was first established as a managerial family system after a period of primitive labor-management relations; it was based on the modal coexistence of a merchant society in the case of office workers and an artisan society in the case of factory workers, which stemmed from feudal labor-management relations that were set on the warrier society mode. With respect to the time period, it corresponds to the period extending from before and after World War I to the late Taisho to early Showa years (1920's) in the case of heavy industry.

Regarding the employment of laborers, a change was taking place in this period from the traditional paternalistic system for craftsmen to the direct-hiring system of corporations. As a result, the in-service training of mainstay laborers and the maintenance of secrecy regarding corporate skills became important. Furthermore, to counter the rising labor movement, efforts were made to secure laborers with "moderate views" who had a strong sense of belonging to the corporations. In addition, partially protected by traditional concepts due to a sense of international danger, the family system management became generalized.

The managerial family system established here attempts to grasp the functional group of a corporation by simulating it as a "household" group, and the following four points can be emphasized regarding the household: (1) continuity: the relationship between the household and its members lasts a lifetime or even longer; (2) priority of the vertical relationship of superior and subordinate rank as parent to child; (3) household accounting that goes along with management as a family business: the closeness of production life to consumption life; and (4) the theory that a household group always has priority over an individual.

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1. H. Hazama, "Study of the History of Japanese Labor Management," Diamond Co, 1964, Chap 1.

When these are applied to a corporate group, the following five characteristics emerge: (1) ranking system (or seniority system) in the management societal order--especially the status difference between the office staff and factory workers, and among the factory workers, an order based on years of service, so-called seniority; staff positions that seem too numerous and unnecessary for functional efficiency--this is especially marked among office staff members; (2) a life-time employment system as a hiring arrangement--this is the reward for loyal service to the corporation; (3) seniority type (or ranking) wage as a wage system--ranking wage based on a ranking system in the management societal order, particularly a seniority system wage; incorporation of additional pay to promote production; (4) corporate welfare and benefit system as living as security--low wages are compensated by welfare and benefits, and the two function as one; by including both, this is called the salary system of the family system economy; (5) family system ideology in labor-management relations--employees exist only when the company exists.

In addition, regarding item (3), we may add that continuous service rewards and retirement funds have been established to promote long service. Also, the fact that temporary workers and women were excluded from this management practice is noteworthy. Since World War I, the temporary work force has grown so large that it cannot be ignored as a safety-valve for business.

The managerial family system was built on the basis of the concept of paternalism. Awareness of the employer's benevolence and the employee's gratitude was at work, using a simulated system of a family group. This is the inherited paternalism in the master-servant relationship of the Meiji Era.

At any rate, the managerial family system was an effective answer to the "problem of how to incorporate newly born industrial laborers into society" cited by Bendix.[2] Under such an administration, laborers continued tohave a strong sense of belonging to the company and a strong motivation to work in spite of poor working conditions.

The postwar Japanese style management was also built by trial and error, as in the case of its prewar counterpart. During the period following World War II up to about 1960, the managerial family system was rejected in the name of abolishing feudalism, and American style management was introduced. However, starting in the 1960's, Japanese style management has come to be emphasized. For example, the 1965 declaration by the Japan Committee for Economic Development, in which the ideas of Japanese economists are said to be concentrated, stated that traditional management and customs contain elements that will continue to be effective in the future. In particular, it evaluated the employee's enthusiastic loyalty to the company and the sense of intense closeness to the company resulting from the lifetime employment system.[3]

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2. Bendix: Translation as cited before, p 616
3. Regarding the relationship of this declaration and the establishment of Japanese style management, see M. S. Yoshino, "Japan's Managerial System," MIT Press, Cambridge, Mass, 1968 (Y. Uchida, translator in charge, "Japanese Managerial System--Tradition and Revolution," Diamond Co, 1975, pp 127-129.

(2) Structural Elements of Japanese Style Management

In the meantime, the postwar Japanese style management established after the 1960's became basically different from the prewar managerial family system. Hazama called it a "managerial welfare system" and sought its characteristics in the labor-management cooperative theory or the labor-management unit theory, where improvement of the employees' welfare is a central theme. The family system ideology was rejected as undemocratic after the war, and as a consequence, a consideration for the employees' welfare as a responsibility of management came to be emphasized in place of family paternalism.[4]

The establishment of the managerial welfare system was most strongly influenced by the postwar labor movement. We shall trace its course here. In the postwar chaos, it was the labor unions that carried out the role of management, which had lost its function, and continued the existence of corporations. As a result, the unions were not organized on the basis of different industries, but corporate unions developed. The characteristics of the system lie in its universality to include both white collar and blue collar workers and the joining of employees in toto as a rule.[5] In time, the course of reestablishment of the managerial right developed, but the chief demand of the labor unions was defense of livelihood.

For the defense of livelihood, the labor unions had set their primary goal on security of wages and jobs.[6] The wages inevitably became the minimum living wage that guaranteed life in order to decrease corporate activities, and various systems of additional pay were developed in order to compensate for the low wages.[7] In addition, since unemployment is directly linked to a breakdown of life, firing caused the most vigorous resistance from the labor unions. This was linked to a reformation of the lifetime employment custom. Therefore, the existence of temporary workers was again ignored in this case.

Furthermore, in the postwar tide of democratization, labor unions attempted to reject the superior-subordinate order of the prewar ranking system. The goal was to gain uniform equalization, which is understandable on the premise of extreme poverty. Abolition of status differences between office and factory workers, particularly regarding wages, the uniformity of various payments, systematization of equal treatment with respect to uniform wage increases and promotion based on years of service were achieved in this manner.[8] The reformation of the seniority system is none other than the consequence of the realization of such a demand for uniform equalization.

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4. H. Hazama: "Japanese Style Management," NIPPON KEIZAI SHIMBUSHA, 1971 pp 90-98.
5. Solomon B. Levine: "Industrial Relations in Postwar Japan," University of Illinois Press, Urbana, Illinois, 1958 (K. Fujibayashi and H. Kawada, translators, "Labor-Management Relations in Japan," Diamond Co, 1959, pp 116-135).
6. Ibid., pp 146-149.
7. S. Matsushima, "Typical Japanese Characteristics of Labor Management and Related Changes," Diamond Co, 1962, pp 4-5.
8. Ibid., p 343, and Hazama, "Japanese Style Management," pp 87-88.

In sum, the various systems such as corporate unions, lifetime employment, the seniority system, and additional pay were established in Japanese style management as a managerial welfare system. Regarding this type of Japanese style management, additional factors that are frequently pointed out include collective decisionmaking and autonomous control of the workshop group.

First, collective decisionmaking is examined. Management in Japan has a bureaucratic superior-subordinate order that subtly developed, and the power within the corporation is concentrated in the hands of a small number of executive managers. This is due to the fact that there is no organ that can restrain the executive managers because of the weak control power of shareholders. For example, the weakness of shareholders allows the corporation to steer more and more to mutual welfare.

In spite of this, the executive managers rarely use their power in decisionmaking. This is due to the fact that collective decisionmaking based on consensus has become generalized. Here, the group takes joint responsibility regarding the consequence of the decision, and the responsibility of the executive managers is a formality.

Since the methods or conclusions to be discussed at a conference are decided in advance by the advance preparation of a small number of leaders, the conference takes a unanimous form. Items that are beyond the scope of the conference are settled by a circulation/approval system. This system was used by government agencies in the early Meiji Era. Later adopted by private firms[9] it provides a capable person in a low-level position with the ability to make proposals. Whether by conference, or by circulation/approval system, collective decisionmaking requires time-consuming, troublesome procedures. From the standpoint of decisionmaking, the statement by Frederic Harbison and Charles A. Myers is convincing in pointing out that Japanese corporations are a "unique combination of highly centralized dictatorship and democratic management by participation."[10]

Next, reference is made to autonomous control of the work group. In Japan, subgroups which are organized as shop units, with 100 percent participation as a rule,, e.g., the ZD movement, the QC circle, the Midori-Juji group, etc, have been developed. In particular, QC circles aimed at statistical quality control, even improvement of the job and the shop, have achieved a high participation rate and a marked reduction in cost.

Odaka classified them into three categories: (1) voluntary training subgroup system (afterhours, nonshop unit group), (2) semiautonomous shop unit subgroup system (afterhours, shop unit group). He pointed out that (1) tends to become stereotyped and causes a great burden; that the work ethic increases

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9. Yoshino, op. cit., p 282.

10. Frederic Harbison and Charles A. Myers, "Management in the Industrial World," McGraw-Hill, New York, 1959 (H. Kawada and K. Kuno, translators, "Industrialization and Management--International Comparative Studies," Diamond Co, 1961, p 330).

toward system (3); and that shifting toward system (3) has begun.[11] This system identifies with the customary practice of considering achievement by shop unit.

Various factors have been considered above in dividing the management welfare system into a corporate union, lifetime employment, seniority, additional pay, collective decisionmaking, and autonomous control of the shop unit group. What supported the high growth rate of the Japanese economy beginning in the 1960's and the ability to cope with the Japanese economy during worldwide recession after the oil shock was indeed none other than the high productivity endorsed by the management welfare system, which was reorganized around 1960.

(3) Value System of Groupism

Despite being crowned with the same title of Japanese style management, there is a big difference between the managerial family system and the management welfare system. The paternalistic idea of exchanging benevolence for loyalty between superior and subordinate, and the analogy of parent-child relationship to the corporate ranking relationship, have disappeared from the managerial welfare system. In other words, based on a comparison of these two types of systems, the traditional, so-called ranking relationship of superior-subordinate is no longer the essence of Japanese style management. In spite of this, the various fundamental systems such as lifetime employment, seniority, additional pay, etc, are mostly the same.

And the fact that groupism is what runs through these two systems of Japanese style management is agreed upon by many who discuss the subject. Hazama defined groupism as "a group-centered way of thinking, in the relationship of individual and group, where the interest of the group has priority over that of the individual; or, a way of thinking in which ethical significance is added to judge where it is 'desirable' or 'beneficial' to do so,"[12] and contrasted it to individualism.

The value system of groupism is characterized by emphasis on "harmony." Harmony is a cooperative relationship that maintains a long-term balance of interests for the constituents, and it functions only when there is a stability of constituents.[13]

According to the definition of Odaka, "groupism is a value trend where a specific group to which one belongs is understood as a system of common destiny or something like this, and as a consequence the overall peace and happiness of group life, its overall order and continued prosperity and the overall peace and happiness of the group life are regarded as more important than the individual constituent's demonstration of ability or satisfaction of individual desires. And the collectivistic customary practices and collectivistic organization are based on this."[14]

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11. Odaka, "Lecture on Industrial Sociology," pp 330-324. [as published]
12. Hazama, "Japanese Style Management," p 16.
13. Ibid., pp 24-25.
14. Odaka, "Lecture on Industrial Sociology," pp 43-44.

The reason why prewar management used the family "group" as its model and postwar management turned the corporations into welfare "groups" is that they were actually based on such groupism.

Regarding the foundation on which collectivist management stands, Odaka explains the result as identification with the value system and customs of the basic society such as home, village, country, and feudal clan which are the primarysystems of common destiny.[15] However, we shall not discuss this question further here.

At any rate, Japanese management has come to possess a unique position because of its groupism. In the next section, we shall carry on the analysis of its universality as the conclusion of this article.

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[15] Odaka, ibid, p 55.

ECONOMIC

CLOSER RELATIONS WITH ASIAN NATIONS THROUGH TECHNICAL COOPERATION

Tokyo LOOK JAPAN in English Vol 27 No 311, 10 Feb 82 pp 18, 19

[Article by Tomosaburo Yano, Technical Cooperation Division, Ministry of International Trade and Industry]

[Text] Official Development Assistance (ODA) is the mainstay of economic cooperation between the advanced industrial countries and the developing world. In today's world, it plays an important role in deepening international cooperation and is a form of assistance that the industrial world must continue to support.

Japan, despite the fiscal straits in which the government now finds itself, managed to double its ODA expenditure in the three years ending in 1980 and, in January of last year, the government issued a new medium-term plan and announced that it would "continue to make every effort to expand ODA and to increase the ratio of ODA to GNP." Specifically, the government pledged that, over the first five years of the 1980s (1981-1985), it would devote to ODA a sum at least twice that expended over the last five years of the 1970s (1976-1980) ($10.68 billion). In keeping with this, the ODA budget for fiscal 1982 was exempted from the zero growth ceiling imposed on other expenditures. The 11.4% growth in ODA expenditures necessary to meet the five-year target was approved as promised, far outpacing growth in other areas.

The majority of Japanese ODA goes to Asian countries (51% in 1980), both because Japanese foreign aid began as war reparations to the countries of Asia, and because of geographical and cultural considerations.

Technical Cooperation

From its inception, Japan's development assistance has emphasized technical cooperation to develop the human resources needed for nation building. Under the technical cooperation program, development surveys are being conducted, nationals of developing countries are being trained in Japan, and many Japanese technical experts are directing projects in recipient countries.

Table 1 shows technical cooperation expenditures for the Asian region in 1980. From it one can gain a clear idea of the number and geographical distribution of the trainees and experts involved in Japan's technical cooperation programs. These two programs are interrelated and crucial parts of Japan's international cooperation efforts.

The following article describes Japan's efforts to contribute to nation-building through cooperation in research and development and human resources development projects. It is hoped that such cooperation can be expanded in the future.

(1) Research and Development Cooperation

Research and development cooperation means more than just teaching existing technologies to trainees from the developing world. Japanese experts are sent to research institutes and laboratories in developing countries in order to lead research and to develop new technologies appropriate to the specific country. Unless third world countries develop the capacity to develop technology independently, true technology transfer is impossible. As has become clear in recent years, developing countries are no longer content to merely copy technologies developed in the industrialized world, but wish to develop technologies of their own.

A good example of this is the work being done in developing countries on alternative energies and on resource utilization. This effort will enable the developing world to better use its energy resources and to ease the problem of foreign reserves. Its contribution to industrialization will also be great.

a. Alcohol production

For non-oil producing developing countries, alternative energy research is a matter of grave importance. One project which addresses the need for new energy sources is the ongoing effort to produce alcohol from cassava, which is abundant in developing countries.

The basic technology for alcohol production from plant matter has been developed in Japan, but because of environmental concerns and a number of other reasons, this technology is not readily applicable in the developing world.

For this reason, the Japanese Association of Industrial Fermentation, composed mainly of fermenters and distillers, is now engaged in joint research with the Thai Institute of Scientific and Technological Research (TISTR). Equipment and production processes suited to conditions in Thailand are being developed at their test plant in Bangkok. The project began in 1980 and will continue for 4 years; approximately ¥800 million has been allocated for the project. (See Fig. 1)

b. Multiple utilization of tropical resources

Except for fruit, the rich vegetation of the tropics mostly goes to waste. In the Philippines, for example, which is the world's leading producer of bananas, the stalk, which is harvested along with the fruit, has been discarded up till now. Since 1974, the Japanese Research Institute for Polymers and Textiles and the Philippine Textile Research Institute have been studying stalk fibers. As a result of their research, it is now known that stalk fiber is as usable as Manila hemp as a raw material for paper pulp. Philippine experience in industrial and technical development is limited, so Japan is cooperating in the project. A test plant will be built and research into fiber development and multi-purpose utilization of banana plants will be conducted. A major goal of the project is to develop technology specifically adapted to conditions in the Philippines. The project will begin this year (fiscal 1982) and will continue for 5 years. The total cost of the project is estimated at about ¥600 million. (Fig. 2)

Table 1. Technical Cooperation Expenditures for Asian Countries (1980)

Countries	Technical Assistance	(Million U.S.$)	JICA		AOTS	JODC
		ODA	Trainees	Experts	Trainees	Experts
Indonesia	32.71	350.03	315	664	341	30
Thailand	26.19	189.55	282	639	123	18
Philippines	17.80	94.40	190	424	71	16
Malaysia	12.59	65.63	140	241	95	5
Bangladesh	6.29	215.14	112	76	19	2
Korea, Rep. of	6.20	76.30	87	61	137	12
Singapore	5.99	3.77	93	75	159	2
Burma	4.58	152.46	94	102	9	0
Pakistan	4.26	112.42	72	64	23	0
Nepal	3.59	24.26	59	71	1	0
Others	18.20	98.96	331	362	274	26
Total	138.40	1,382.92	1,775	2,779	1,252	111

Note: JICA: Japan International Cooperation Agency
AOTS: Association for Overseas Technical Scholarship
JODC: Japan Overseas Development Cooperation

(2) Human Resources Development

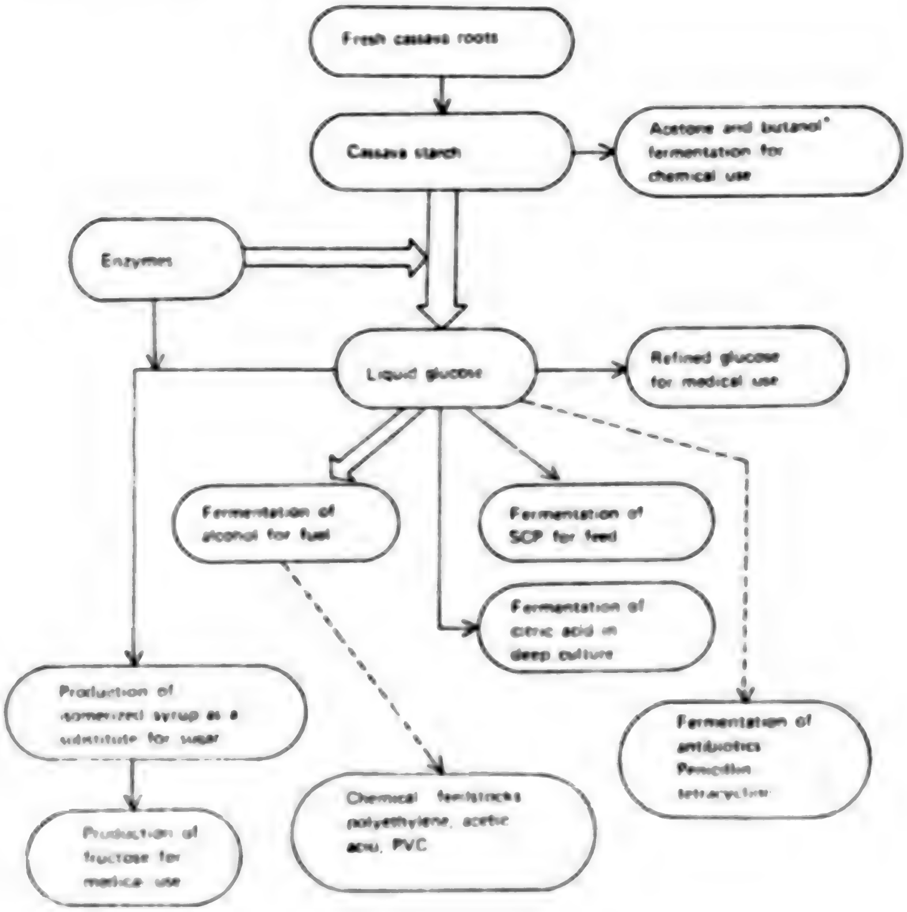
Japan has long recognized the importance of human development as a basis for nation building and as a preliminary to other types of development. In fact, this emphasis on human development could be called a special feature of Japanese technical cooperation. In this regard, Prime Minister Suzuki, during his visit to ASEAN in January 1981, announced the ASEAN Human Resources Development Project. Under this plan, a human resources development center will be established in each ASEAN country. Japan will contribute $100 million in financial and technical assistance to the project.

To put the plan into operation, a series of preparatory Japan-ASEAN Meetings was held last March 31-April 1. As a result of these talks, the following points were decided.

a. Center for Vocational and Extension Services Training (CEVEST)—Indonesia

One of the goals in the third Indonesian five-year plan (1979-1983) is to encourage small-scale industry. The Center for Vocational and Extension Services Training is designed to aid in this effort by training skilled workers.

Fig. 1: Raw Material and Product Flows in The Fermentation Industry


Fresh cassava roots
Cassava starch
Acetone and butanol* fermentation for chemical use
Enzymes
Liquid glucose
Refined glucose for medical use
Fermentation of alcohol for fuel
Fermentation of SCP for feed
Fermentation of citric acid in deep culture
Production of isomerized syrup as a substitute for sugar
Fermentation of antibiotics Penicillin tetracycline
Production of fructose for medical use
Chemical feedstocks polyethylene, acetic acid, PVC

The project differs from most other development projects in that it is targeted at the development of small-scale industry.

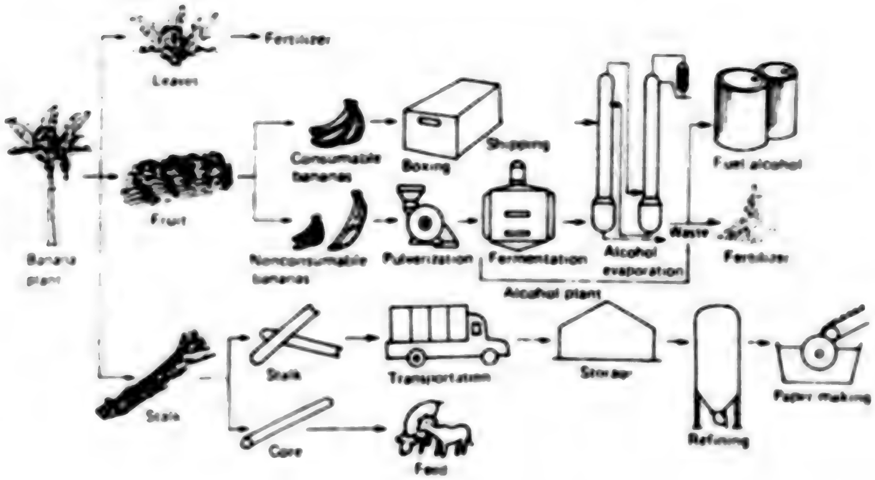
b. Center for Instructor and Advanced Skills Training (CIAST)—Malaysia

The aim of this project is to train instructors for existing training centers in Malaysia. It will also provide advanced training in technical skills and teaching methods for graduates of the centers. Training programs will be offered on automobiles, machine tools, electronics, quality control, and four other subjects.

c. Center for Rural Development through Strengthening of Agro-Industrial Livelihood Activities (KKK)—the Philippines

This Center will be part of the "Life-long College" begun by Mrs. Marcos to encourage the growth of learning among all Filipinos, regardless of educational or social level. The Center will supervise programs providing assistance to small businesses and agro-industries as well as regional development programs (training programs in construction trades, home industry, non-traditional crafts, and marine product cultivation and processing).

Fig. 2: Uses of The Banana Plant



d. Institute for Continuing Occupational Development (ICOD)—Singapore

To help ensure consistent economic growth, the Center will offer educational and training programs aimed at raising the educational standard of workers in Singapore. About 100,000 persons will benefit from center programs which will use VTRs, audio-visual materials, and the broadcasting network.

e. Training Center for Primary Health Care (TCPHC)—Thailand

Programs in mother-child health care, infectious disease control, nutrition, immunology, sewage treatment, and three other areas will be offered at this center. This project will improve health care at the community level. Additional goals of the project are to raise the health consciousness of rural inhabitants and to train staff for rural health posts.

In addition, an International Center for human development in ASEAN will be established in Okinawa. The Center will be operated as an auxiliary body under the auspices of the Japan International Cooperation Agency. It will serve as a technical training center for ASEAN nationals, as a place to provide orientation services for experts about to leave for an ASEAN nation, and as an information clearinghouse and liason office for the ASEAN centers.

Conclusion

Japan is now one of the most prosperous countries in the world, but a hundred years ago it was a poor country struggling to support a population of 30 million without natural resources or advanced technology, and with only limited financial resources. What enabled Japan to develop as it has was a highly educated and motivated population. Japan's success in the last 100 years has been the result of human development: Japan's frugal and highly educated population has been the base of her success. Human resources, with appropriate direction from the government and introduction of Western technology, fueled and made possible Japan's drive to ever higher goals. Free competition also stimulated the people's desire to improve themselves. Thus motivated, laborers were able to make full use of the raw materials and technology brought into Japan from abroad. Japan's rebound from the destruction of World War II as well as its period of high economic growth in the 1950s and 1960s were made possible by an inexhaustible supply of human resources. The desire to improve has provided the impetus for modernization.

The attitude of a country's people toward development and nation-building is probably the most important determinant of whether or not nation-building will succeed.

CSO: 4120/156

SCIENCE AND TECHNOLOGY

REPORT ON INDUSTRIAL ROBOTS' IMPACT ON WORKFORCE

OW030419 Tokyo KYODO in English 0348 GMT 3 Mar 82

[Text] Tokyo, 3 Mar (KYODO)--The honeymoon between Japanese workers and industrial robots may soon be over as the sophisticated machines take over more and more jobs, Minister of International Trade and Industry Shintaro Abe told a special advisory panel to the labor minister Wednesday.

The advisory panel to Labor Minister Takiichiro Hatsumura met at a downtown hotel to exchange views on the industrial robots and their effect on employment.

Japan presently has some 100,000 industrial robots in operation, accounting for 80 percent of the world total.

"So far robots have been introduced into dangerous workplaces and have been used for jobs human workers don't want to handle. They've been in a honeymoon with labor," Abe said.

But he warned that major problems are expected in employment in the future and said that MITI, the Labor Ministry and the Economic Planning Agency must cooperate to work out appropriate responses.

Labor representatives on the panel said the rapid diffusion of more sophisticated robots into smaller enterprises as well as major firms could lead to unemployment among older workers.

They also expressed concern that Japan's rapid plunge into robot technology compared with the more cautious approach in Europe and the United States could lead to new trade frictions.

However, robot users countered that it is necessary to encourage technological innovation. They pledged that even if robots and automated factories cause changes in work patterns, they will not lay off workers.

They called on labor to actively cooperate in work transfers and other countermeasures.

MITI and the Labor Ministry will launch an extensive investigation into industrial robots beginning in April.

CSO: 4120/175

SCIENCE AND TECHNOLOGY

NEW DEVELOPMENTS IN JAPAN'S POLICY FOR INFORMATION INDUSTRIES

Tokyo LOOK JAPAN in English Vol 27 No 311, 10 Feb 82 pp 22, 24

[Article by Electronic Policy Division, Machinery and Information Industries Bureau, Ministry of International Trade and Industries]

[Text]

Meaning and Role of Informatization

The development of an "information society" has become conspicuous in the last decade. Computers have become commonplace, especially since the volume of information is increasing.

Society is undergoing a major change; information is being used more skillfully, more rapidly and more consciously that ever before. For the sake of brevity, we may call this process of broad social change "informatization." Informatization is not only contributing to the improvement of the productivity and the conservation of resources and energy in the industrial sector, but is also helpful in solving social problems and is increasing the range of mankind's activities.

Moreover, informatization will exert influence on the cultural life of the society and make high culture far more accessible to the public than it has been in the past. The influence which informatization is exerting on society is of an extent and depth matched only by the industrial revolution. The degree of success with which informatization is carried out will determine the future of human society.

Present Situation and Problems of Informatization in Japan

(1) Informatization in the 1970s

Informatization progressed rapidly in Japan in the 1970s as businesses and government agencies introduced computers. The use of computers grew, encouraged by diverse users' needs and technological breakthroughs.

(2) Evaluation of Informatization in the 1970s

(a) Factors accelerating informatization

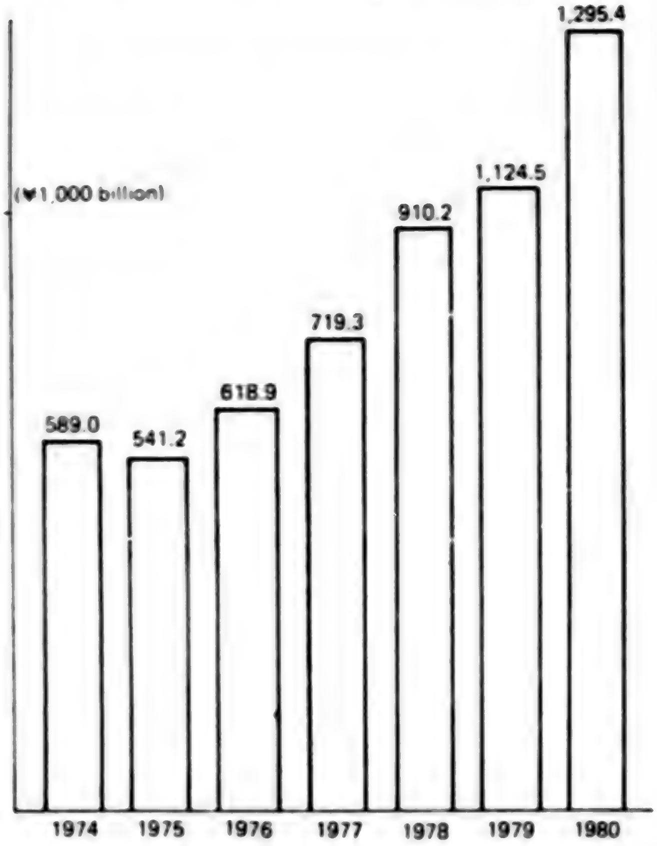
Several factors accelerated informatization in Japan during the 1970s. Technological improvements, particularly the remarkable progress made in semiconductor technology and the development of microcomputers, made computers practical in many new applications. Japanese social and cultural characteristics, the high educational level of the public, the quality of the labor force and of the educational system which produces it, racial characteristics of homogeneity, Japan's go-ahead spirit and determination to improve productivity, its favorable labor-management relations, etc., encouraged rapid informatization.

Finally, the intelligent policies decided on by the government and industry to promote informatization speeded developments which technological change and the nature of Japanese society made possible.

(b) Problems of informatization in the 1970s

Informatization in Japan in the 1970s was rapid but uneven and was centered in large-scale enterprizes such as manufacturing, finance, and insurance. Disparity in levels of informatization

Production by the Computer Industry



Comment: Production of Computers and computer-related equipment in Japan has shown a high growth rate of 15-20%, reaching ¥1,295.4 billion in 1980.

developed among industries and between urban and rural areas. There is a danger that these disparities will increase, casuing uneven economic development and growing social inequities.

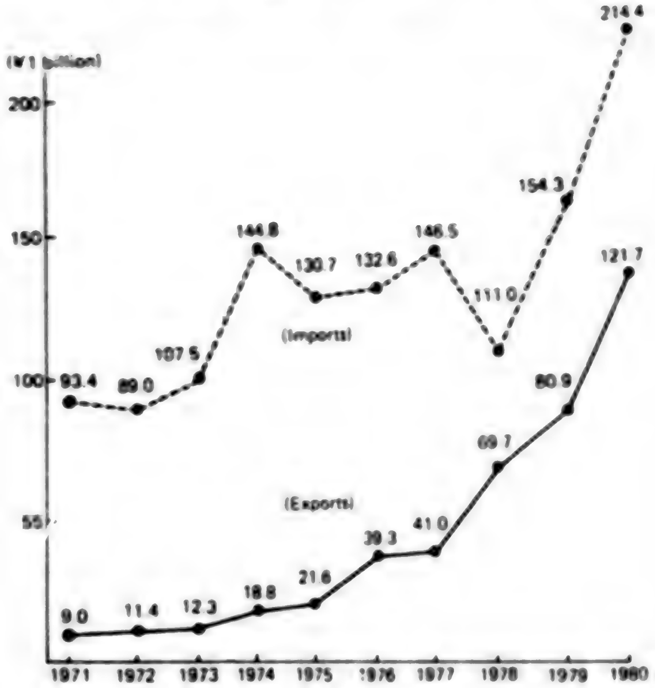
Furthermore, rapid progress in informatization has often created new needs which existing social institutions are unable to cope with. For example, legal protection of software and of individual privacy, and legal and institutional ability to prevent computer crime are all lagging. Similarly, reexamination of the use of communications cricuits is urgent.

Prospects for Information Society in the 1980s

(1) Possibility of Full Information Society

In the 1980s, it is necessary to further

Export-Import Trends in Computer



Comment: Both export and import of computers have expanded, but imports are still far higher.

extend the economic affluence brought on by the informatization achieved in the 1970s and to apply the results to qualitative improvements of the people's livelihood. Similarly, it must be ensured that the new society created by informatization is a humane and comfortable one in which people can display their individuality and seek self-realization through the active use of information.

We must keep as our goal in the 1980s the creation of an individualistic and humane information society through brisk economic activities, which will allow Japan to fulfill its responsibilities as a member of international society.

(2) Prospects in Industry

(a) The manufacturing sector

Further improvement and integration of production through wider application of intelligent robots, automatization of multi-kind and low-volume production, and improvements in quality control and productivity, will be achieved by combining intelligent robots with CAM (Computer Aided Manufacturing) systems. The recent development of sophisticated CAD (Computer Aided Design) systems has greatly facilitated design work which previously required a great deal of manpower and time, and has improved productivity drastically. Further economies can be expected from combination of CAD systems with CAM systems through a database. Computer engineering systems, which can store and supply techniques, will come to be important.

(b) Business management

Many routine office tasks, such as compiling statistics, handling documents, and window service as well as information storage and filing, can now be done by computers. Office automation will become more widespread in the future.

By introducing such technologies as Japanese language word processing, voice, letter, and image recognition systems, and electronic filing, offices will be made more pleasant and more efficient.

(3) Prospects for Society

The people's needs for qualitative improvements in their lives will become more diversified as income and age levels rise and the national consciousness changes. By making the best use of information, communications, and systematization technologies, it will become possible to improve a number of services such as city administration, medical care, education, and traffic control. In addition, new information media will proliferate into all the corners of society and daily life. Therefore, it is expected that the "vital society" and the "comfortable life" will be realized in which people can fully display their individualities.

(4) Effects on Daily Life

If computers become more compact and inexpensive and home computers become popular, control of electric household appliances can be systematized and centralized. Informatization in the form of home automation will improve the quality of life. As information and the five-day working week become commonplace, leisure time will increase, and sports, cultural activities and hobbies will grow in popularity. Lifetime education using home computers will become possible and instruction and information on topics of interest like hobbies, shopping, etc., will be readily available.

If information networks are formed which cover entire communities, new services such as a video information service will become possible. Such a development will strengthen the general sense of community and improve the quality of life.

Prospects and Problems for the Information Industry in the 1980s

(1) Computer Industry

(a) Present situation

In 1980, Japan's computer industry had total sales of ¥1,300 billion. The industry is not yet mature, but growth remains high, always surpassing the growth rate of GNP.

(b) Prospects

Computerization will continue in various fields in the 1980s and demand for computer systems will diversify. The computer industry will have to supply systems ranging from ultra-large-scale computers to personal ones, and from general-purpose computers to special-use ones like microcomputers. Further, a number of new companies will enter the industry. The computer industry will be one of the key industries in the 1980s; demand will be strong for general-purpose computers.

(c) Problems

The main problem facing the computer industry in the 1980s will be the challenge of developing creative and highly advanced technologies. It will have to develop technologies which combine the seeds of state-of-the-art technologies and the needs of information processing.

The second problem will be meeting increasingly diverse needs accurately.

The third challenge will be to ensure informatization efficiently by maintaining a level of effective competition through market mechanisms.

Fourth, a smooth international development of informatization must be ensured; Japan must contribute to it on a global scale.

(2) Information Processing Industry

(a) Present situation

Sales of information processing equipment reached ¥596.6 billion in 1979 and there were 1,390 companies in the field. The average annual growth rate over the past five years has been approximately 20%. However, business conditions are not yet ideal and the industry is still immature.

(b) Prospects

Although it is difficult to forecast the development of the information processing industry, it is anticipated that firms in the field will follow one of the following strategies depending on their characteristics.

First, firms may choose to seek out speciality products which can meet users' needs promptly and accurately using information processing technologies.

Second, they may concentrate their efforts on technological innovations in the communications field, and promote on-line networks which satisfy requirements for systematization in industries and society.

The third will be in database services which will winnow essential information from the growing oversupply of data.

The fourth major product area is software which will see demand for products which can reduce current software costs.

The fifth strategy will be to create systems that can produce and sell combined software and hardware packages.

Sixth, major firms may seek to compete on a global scale.

(c) Problems

There still remain a number of problems which must be overcome before the industry reaches maturity.

First, management must be improved and dependence on subcontracting ended.

Second, productivity must be improved, advanced information processing technologies must be refined, and the ability to specialize in the special technology field must be developed.

Third, the social infrastructure, e.g. computer security, must be established.

Other problems which face the information processing industry include: insufficient copyright security for software; an unfavorable tax structure; imperfect standardization; and certain unfavorable business conditions including unavailability of high restricted communications circuits.

Policy for the 1980s

(1) Necessity for an Information Industry Policy

In order to reach effective informatization, the government must simultaneously clarify desirable development policies and actively enforce policies necessary to ensure creativeness and vitality of the private sector, obtaining understanding and cooperation from the people.

It is necessary to enforce new policies actively and resolutely, to reexamine old policies, and to target policies at strategically important fields.

The informatization policy will build a new social infrastructure and so will benefit industry, society, and the people in the future. Accordingly, the policy must be conducted steadily and systematically and have a long-term perspective. It should be noted that interruptions in its enforcement owing to short-term financial circumstances would create tremendous trouble in the future. It is also necessary to provide stable funding for the policy.

(2) Promoting the Development of Information-Related Technologies

(a) Development of software-related technologies

As costs for hardware have fallen while quality has risen, software costs as a portion of total information processing costs have been increasing and the necessity for further development of software has been mounting, but the development history of software is short and production systems are not yet complete. Japan lags far behind the U.S. and European countries in the development of large-scale software and advanced information processing technologies. This poses obstacles to informatization in Japan. The government plans to promote the development of the following technologies:

(a) Basic software technologies for next generation computers with a variety of sophisticated functions and easy operability;

(b) Software production and maintenance technologies which facilitate development and maintenance of high-reliability software through computer design;

(c) Advanced information processing technologies which can apply information processing technology like pattern information processing;

(d) Large-scale software technologies for the development of new energy, space and sea utilization, and other systems;

(e) High-generality and operability software for the promotion of software flow.

(b) Development of advanced and innovative technologies

(i) R & D of a high-speed calculation system for science and technology

Since science and technology require tremendous amounts of calculation in meteorological forecasts, nuclear fusion research, space development, etc., a high-speed calculation system for science and technology is needed. In order to realize the system, new devices like Josephson Junction devices and the super-parallel processing system should be developed. Since such development implies enormous costs and great risk, smooth development can not be left to the private sector. Therefore, the government plans to undertake the development.

(ii) R & D of Fifth Generation Computers

As informatization progresses, sophisticated and easy-to-operate computers are in increasing demand, especially those which can be used by those who do not possess knowledge of computers. In conventional computers, problems have been encountered as software becomes huge and complicated to satisfy diverse demands. In solving these problems, it is necessary to promote research and development of fifth generation computer systems that will meet requirements for sophisticated functions in the 1990s.

(3) Promotion of Global Development

Japan should take the initiative in grappling with the problems of advanced and innovative technologies. The information industry of Japan must not be only promote information and personnel exchanges on a global scale, but also support industrial cooperation with other countries in various fields. Better use of concessionary financing should be examined, as well. Furthermore, since

Number of Enterprises and Employees, and Annual Sales

	Number of enterprises	Number of employees (1,000)	Annual sales (¥1 billion)	Per enterprise		Annual sales per capita (¥1 million)
				Number of employees	Annual sales (¥1 million)	
1974	1,055	59	245.3	56	233	4.2
1975	1,010	57	275.1	56	272	4.8
1976	1,009	59	307.0	58	304	5.2
1977	1,309	72	412.6	55	315	5.8
1978	1,336	77	460.2	58	344	5.0
1979	1,390	91	596.6	65	429	6.6
Average increase ratio (1979/1974)	5.7%	9.1%	19.5%	–	–	–

Comment Sales by the information processing industry have conspicuously increased. Average annual growth has been roughly 20% in the past five years, reaching ¥596.6 billion in 1979.

gigantic and complicated technologies will appear which are beyond the development capacity of a single country, an international joint development system should be considered.

It will be necessary to train technicians and experts who will be in charge of informatization of developing countries as part of economic and technical cooperation. In addition, it will be also necessary to cooperate with other countries to improve social systems like medical and educational systems, and others.

Comparison of Japanese and U.S. Information Processing Industies

	U.S.	Japan
Sales (¥1 billion)	521.6	85.9
Number of employees (1,000)	64.2	8.8

Note 1. Total for ten largest U.S. enterprises ($1 = ¥200)
Note 2. Total for ten largest Japanese enterprises

Comment (1) Conspicuous disparity can be seen in the scale of major information processing enterprises in Japan and the U.S.
(2) The size of major information processing enterprises in Japan is one-sixth that of similar companies in the U.S.

CSO: 4120/156

JAPAN TESTS FIBER OPTICS TRANSMISSION SYSTEM

OW171335 Tokyo KYODO in English 1245 GMT 17 Feb 82

[Text] Tokyo, 17 Feb, KYODO--Japan has successfully conducted a field trial of a submarine, repeater-equipped long-distance fiber-optics transmission system, it was announced Wednesday.

The governmental Nippon Telegraph and Telephone Public Corporation (NTT), which conducted the trial, said the success means Japan has taken a big step toward putting a long-distance submarine fiber-optics communication system into practical operation.

An NTT spokesman said the corporation would continue research on the system so that it may be put into practical use between Southern Kyushu and Okinawa, a distance of 1,000 kilometers, by fiscal 1985.

The spokesman said submarine fiber-optics cables totaling 45 kilometers in length were laid late last month on seabed at depths up to 1,000 meters off Yahatano on the East Coast of the IZU Peninsula, Southwest of Tokyo, by the submarine cable-layer Kuroshio Maru.

The two repeaters, are 15 and 30 kilometers apart on a cable loop. The system has a transmission rate of 400 megabits and is of single-mode type, the spokesman said.

He said as a result of the test, it was confirmed that high-speed digital signals, equivalent to 5,760D telephone circuits, could be accurately transmitted by the system over a 45-kilometer distance in a rigorous submarine environment.

The spokesman said that a short-haul nonrepeatered submarine fiber-optics transmission system field trial was successfully conducted by NTT in 1980.

Submarine fiber-optics cables totaling 10 kilometers in length were then laid from Inatori to Kawazu along the East Coast of the Izu Peninsula, near the site of the latest trial. The transmission system tested at that time consisted of submarine fiber-optics cables with repeater equipment at both shore terminal stations, but without any submarine repeaters, he said. The spokesman said that in Britain, an eight-kilometer nonrepeatered submarine fiber-optics transmission system of the 140-megabit type was tested in May 1980.

CSO: 4120/164

NTT TO SEND TEAM TO U.S. TO LOOK FOR PARTNERS

OW030951 Tokyo KYODO in English 0849 GMT 3 Mar 82

[Text] Tokyo, 3 Mar (KYODO)--The Nippon Telegraph and Telephone Public Corp. (NTT) will send a team to the United States in mid-March in quest for American partners in the development of new telecommunications equipment, the NTT president said Wednesday.

Hisashi Shinto, the president, told reporters that a team, led by Mitsuharu Maeda, senior managing director, and a top expert on such equipment, would hold talks with U.S. manufacturers of such equipment. He declined to name any of them.

NTT has since last June invited telecommunications equipment manufacturers, both Japanese and foreign, to apply for partnership in the development of nine types of new equipment.

Twenty-five companies have so far applied, and only one of them is a foreign company, Motorola, Inc. of the U.S., "to our disappointment." Shinto said.

"That's why we are sending a research team to the U.S.," he said.

Since January 1 last year, NTT has bought yen 13.3 billion (dollar 56.6 million) worth of telecommunications equipment and related materials from a total of 49 companies through international bidding, according to an NTT spokesman.

Ten of the successful bidders were foreign companies, which won NTT orders totaling yen 900 million (dollar 3.8 million).

Since mid-1981, NTT has invited applications from telecommunications equipment makers for partnership in the development of nine types of new equipment.

The nine are Japanese teletex terminal equipment, digital echo suppressors, mobile telephone equipment, intra-frame coding and decoding equipment, radio repeating equipment and channel switching equipment for a 2GHz 32m bit/sec digital radio-relay system, 20GHZ digital radio-relay equipment, 30/20GHZ band small earth-station equipment for a small capacity omni-use terminal satellite system and bilateral repeaters, conference telephone repeaters and domestic satellite echo canceller terminals.

Only one foreign company, Motorola, has so far applied for the partnership arrangement. Motorola's application is now being screened, an NTT spokesman said.

The spokesman said: "We hope that American and other foreign companies will be much more positive in joining in the development of such equipment, since we have opened our door very wide to foreign companies."

He said that in its quest for development partners, NTT has so far held seminars twice in the United States and several times in Japan.

CSO: 4120/176

SCIENCE AND TECHNOLOGY

SINGLE CHANNEL LSI CODEC DEVELOPED

Tokyo LOOK JAPAN in English Vol 27 No 311, 10 Feb 82 pp 20, 24, 25

[Text] *Japan has developed a new family of PCM multiplex equipment (PCM MUX) for the evolving digital networks. Newly developed single channel LSI CODECs, together with synchronous digital multiplexing, make it possible not only to reduce PCM MUX cost and size, but also to provide such benefits as flexible network management and low cost maintenance. Three different kinds of equipment are provided to meet network requirements. The voice channel unit, containing LSI CODECs, is compatible for all equipment categories and increases productionally. A plug-in digital access port for digital data is available to provide new service readily. Channel testing can be remote controlled through an on-chip analog loopback circuit. The new PCM MUX family is expected to facilitate the digitalization of NTT's telephone networks.*

Introduction

PCM multiplex equipment (PCM MUX) has played an important role in reducing the cost of short-haul circuits. In Japan, the 1.544 Mbit/s PCM-24 system ($\mu=100$ diode companding) were first introduced into NTT's network. Today, the PCM-24B system ($\mu=255$, segmental companding) at the same bit rate are being installed extensively. In these systems, the 24-channel shared CODEC performs encoding, companding, and multiplexing. To digitalize the middle and long-haul circuits, it is necessary to further reduce the PCM MUX cost. In the shared coding, CODEC cost per channel can be remarkably reduced as a result of sharing.

In PCM MUX digital network application, other than the conventional point-to-point digital carrier application, it would be necessary to interface, for example, between synchronous digital office terminals and analog exchanges, etc. The single channel LSI CODEC economically and flexibly realizes different kinds of PCM MUXs required for digital networks. This is the main reason NTT's new PCM MUX family utilize a monolithic CMOS LSI CODEC per telephone channel, which has been newly developed as the standard PCM CODEC in NTT's networks.

The following describes basic design philosophy and main features of the family, and explains detailed design parameters, such as coding frame format, signaling transmission, maintenance and testing.

Basic Design Philosophy

As LSI technology has made rapid progress recently, the LSI Single Channel Codec can be produced economically. It is possible to compose a PCM MUX which utilizes this LSI. Comparison of the new PCM MUXs and existing PCM-24/24B systems shows that the latter employs PAM multiplexing with discreate shared codec, and the former employs LSI Single Channel Codec with synchronous digital multiplexing.

(a) Reasons for Using an LSI CODEC

The LSI has several general merits, such as economy, high reliability, small size, and low-power dissipation. The most important factor is economy. This is the main reason why PCM MUX utilizes an LSI Single Channel Code. Generally, LSI circuitry economically carriers some surplus functions on its chip. Thus, the CODEC LSI chip provides additional circuits other than that for speech coding, which makes loopback from decoder output to encoder input when activated for remote speech channel testing.

LSI CODECs realize large capacity accommodations, thanks to their small size and low power dissipation, resulting in floor space saving.

(b) Reasons for Synchronous Multiplexing

Direct access to an individual channel at the multiplexed level is easy because the new PCM CODECs employs synchronous multiplexing technique to combine PCM and other digital signals. To promote maintenance efficiency together with item (1), this merit is applied to testing signal insertion and separation.

(c) Multiplexing Structure

As the new PCM MUX is divided into a coding step and a multiplexing step, the equipment structure increases flexibility.

Therefore, it is possible to accomplish the following:

(i) In order to promote the common use of trans-PCM MUX economically, the new PCM MUX employs a configuration which makes it possible to change to another kind by a change in the multiplexing step only.

(ii) In order to promote the common use of transmission equipment with telephone service and non-telephone service, the new PCM MUX employs a configuration which makes it possible to mix telephone signals with non-telephone signals on the same transmission line by a change in coding step only.

Design Philosophy

(1) Applications for Digital Networks

The new PCM MUXs generation has been developed to promote network digitalization. The following PCM MUXs are required for application to digital networks.

Category 1, operated at 1.544 Mbit/s, is installed in local offices as a short haul digital carrier. It faces the secondary synchronous digital multiplexer (M_{20}), or Category 1 PCM MUX, or the existing PCM-24B MUX.

Category 2, operated at 6.312 Mbit/s, is installed in hub offices without M20 as a 6.312 Mbit/s or higher bit rate digital carrier. It faces either M_{20} or Category 2 PCM MUX.

Category 3, operated at 8.192 Mbit/s, is installed in hub offices with M_{20} for the interfaces between M_{20} and analog exchange and for the interfaces between circuits in metallic cables and a digital exchange.

(2) Digital Access Ports

To provide economical circuits for digital services, such as digital data, the digital data transmission system has been installed widely since 1977. However, this system is primarily designed for use in central offices with a large number of customers within a nearby area. Therefore it would be relatively expensive for the system to serve areas where only a few digital service channels are required, or it would be technically impossible to extend digital services to customers in new locations far from the central offices.

Therefore, digital service areas are able to be expanded economically, if telephone and digital service signals are mixed and transmitted on the same digital transmission line, such as PCM-24 repeater line connected with central office and end office accommodating these customers. The new plug-in units, called digital access ports, were developed to meet such needs. A digital access port is now used for 64 Kbit/s circuit. The unit simply replaces the voice channel unit and produces six 64 Kbit/s circuits.

With digital access ports, the new PCM MUX makes possible the mixed transmission of both telephone and digital service signals.

(3) Coding Method

It is necessary that all CODECs, including existing PCM-24B terminal equipment, in NTT's network be able to face each other. Also, it is necessary to meet characteristic requirements for up to seven tandem digital links. Therefore, the design objectives for the new PCM MUX were determined to conform to

Table 1: Coding Method

Sampling Frequency	8 kHz
Companding Law	$\mu = 255$ 15-segment approximate
Number of Bits	Category 1 : $7\frac{5}{6}$ bit Category 2, Category 3 : 8 bit

Table 2: Frame Alignment Parameters

	Forward Protection Stages	Reframing (maximum)	Back Protection Stages
1.5 Mbit/s New Frame	4	12.4 ms	2
24B Frame	4	6.0 ms	2
6.3 Mbit/s Frame	7	3.6 ms	3
8.2 Mbit/s Frame	1	0.125 ms	2

CCITT Recommendations G712 and G711.

This coding method is shown in Table 1.

(4) Signaling Transmission

The conventional PCM MUX, such as PCM-24B terminal equipment, adopts the bit stealing approach. However, the bit stealing approach causes S/Nq degradations and loses the 64 Kbit/s bit sequence independency. When a call is connected through a full-digital path, but is bit-robbed at any seven transmission links, a calculation shows about 8 dB S/Nq degradation from the ideal value, that is only about a 2 dB improvement over the present. Thus, the new PCM MUXs employ out-slot signaling, except for Category 1, which must use the bit stealing technique due to the lack of spare bits.

The out-slot signaling bit rate was determined to be 1 Kbit/s per channel, which satisfies the specification for less than 2 ms signaling distortion.

M_{12} makes cross connections in groups of 6 voice channels (384 Kbit/s) with associated 8 Kbit/s status signal (ST signal).

Therefore, it is possible to make the ST signal serve as an out-slot signaling carrier. The ST signal can transmit not only normal signaling but also alarm indication signals (AIS) for a digital path. Category 1 PCM MUX must utilize the bit stealing technique. In this case the signaling bit rate is 8/6 Kbit/s per channel. When M_{12} is connected to a 1.544 Mbit/s digital link, the signaling carried through a bit steal channel is converted into an ST signal at the M_{12} interface port.

(5) Maintenance

The PCM MUX has two functions, signal converting and circuit terminating. Its maintenance has two corresponding aspects.

Considering the future trends of transmission systems maintenance, the number of facilities per manned or unmanned office is expected to increase. Therefore, it is indispensable for newly developed equipment to possess functions that make possible efficient, rapid, low-cost maintenance. The most important thing is to centralize or automate (1) sensing fault conditions and (2) fault location, which are comparably complicated and take a long time to perform using traditional methods. From this stand-point, the maintenance design concept for the new PCM MUX is as follows.

(1) In order to help determine the appropriate corrective action, it is necessary to alert repairment of abnormal conditions in as much detail as possible, directly or through some processing from a failure source. For this purpose,

Table 3: System Parameters of New PCM Terminal Equipment

Category / Parameter	1	2	3	PCM-24B
Multiplex Bit Rate	1.544 Mbit/s	6.312 Mbit/s	8.192 Mbit/s	1.544 Mbit/s
Multiplexing	24 CH	96 CH	120 CH	24 CH
Signaling Transmission	Bit stealing	Out-slot ([illegible])		Bit stealing
[illegible]	SRM			
[illegible]	—		Code rule violation	Alternate pattern
[illegible] Testing	Automatic testing by STECS			Point supervisory
Capacity/Bay	480 CH	384 CH	480 CH	240 CH

Note STECS—Synchronous Terminal Equipment Control System the conventional method using relays is inadequate. Therefore, the new PCM MUX provides a supervisory interface based on a certain transmission protocol, capable of processor-controlled handling through it.

(2) Common equipment units in the PCM MUX, which have a great effect on a system's reliability, should be provided with in-service monitoring. For channel units, on the other hand, it is too costly or technically difficult to perform in-service monitoring. Therefore, the following capabilities are desirable.

To examine channel units by external test equipment, which many channels can share, resulting in low cost diagnostic tests.

To monitor a channel when it is in service, and to perform various measurements in detail when the channel is idle. The new PCM MUX provides test and associated control interfaces to centralize these testings.

From the viewpoint of automated or centralized testings, channel tests can be newly classified into five types.

Full-digital channel access can be easily accomplished because the new PCM MUX employs the synchronous multiplexing technique to combine PCM and other digital signals, which allows direct access to an individual channel at the multiplexed level.

A 64 Kbit/s digital path between offices is examined by a pattern matching technique, transmitting and receiving a digital test sequence in the manner illustrated as Method 1. Digital signal processing is utilized when checking the voice channel unit digitally by Method 4, through the earlier mentioned LSI CODEC's analog loopback circuit.

As a function of terminating a digital section or a digital path, the new PCM MUX detects the loss of frame alignment and the alarm indication signal (AIS) from upstream, reporting them to maintenance personnel as alarms.

Also, M20 makes cross connections in groups of 6 voice channels (Handling Group; HG), so Categories 2 and 3 PCM MUX detects the loss of frame alignment and the alarm indication signal for every group of 6 voice channels, reporting them to maintenance personnel as HG alarms.

Thus, since it has direct channel access to the multiplexed signal, the PCM MUX could be thought of as "the DCAT with CODECs." That is, its maintenance philosophy can be made closely concerned with that in the integrated digital network, providing a unique maintenance method, not dependent upon whether the switching equipment is analog or digital.

Hardware Configuration

The new PCM MUX channel bank is basically composed of voice channel units (VCU), signaling channel units (SCU), and common units. Because of the difference in signaling and transmission digit rates, three PCM MUX categories are furnished. The VCU is compatible for all categories.

The digital access unit provides the centralized interface for a 64 Kbit/s digital signal to be multiplexed onto/from a transmission signal. It replaces the VCU and provides six 64 Kbit/s circuits, the same numbers as the VCU does.

In the case of common signaling circuit, as signaling channel unit is not plugged into a bay, the new PCM MUX has an economical configuration.

(1) LSI Single Channel CODEC

The CODEC LSI consists of an A/D converter, which functions to convert a voice signal into the digital signal of an 8 bit PCM, a D/A converter, which functions to reconstruct voice signals from PCM signals, band limiting filters and PLL circuit, which function to generate an internal clock.

The LSI has integrated all functions in a single 4.35 mm x 7.00 mm chip, which is mounted in a small 16 pin DIP.

The LSI employs a power reduction mode so as to reduce power dissipation when there is no input signal. Thus, small power dissipation of 35 mW (2mW in power reduction mode) is achieved.

(2) Multiplexing Method

(1) Category 1

The encoded 6 voice channel (HG) signals are buffered at the output gate in VCU. Then, these 4 HGs are combined by wired OR into a 1.544 Mbit/s pulse stream, together with a frame alignment signal an error detection code and data link bits in common units (6 x 4=24 channels).

Category 1 PCM MUX employs a

private LSI, which functions to combine 4 VCU output signals into a 1.544 Mbit/s pulse stream (multiplex), divide 1.544 Mbit/s pulse stream from transmission lines into a 4 VCU input signal (demultiplex), establish frame alignment, detect transmission line error and extract a timing clock from a 1.544 Mbit/s pulse stream.

(2) Category 2

The encoded HG signals are buffered at output gate in VCU. Then, these 4 HGs are combined by wired OR into 1.578 Mbit/s in common units in the same way as for Category 1.

Then, this 1.578 Mbit/s 24 channel signal is converted into 6.312 Mbit/s in another common unit and four 24 channel signals are combined into a 6.312 Mbit/s pulse stream together with frame alignment signals, error detection codes and data link bits (6 x 4 x 4 x = 96 channels).

(3) Category 3

The encoded 24 voice signals are combined into a 2.048 Mbit/s stream in the same way as for Category 1, and then, in a common units, this 2.048 Mbit/s signals is converted into 8.192 Mbit/s and five 24 channel signals are combined into an 8.192 Mbit/s pulse stream together with a frame alignment signal (6 x 4 x 5 = 120 channels).

(3) Bay Structure

The new PCM MUX bay construction has standard external dimensions: 2,750 mm (height) x 520 mm (width) x 225 mm (depth).

In the new PCM MUX, 24 channels were set as one block (Channel Block), and the station cables were directly let into the block connectors through the side cable duct.

Conclusion

In this article, the new family of PCM MUXs, which use single channel LSI CODECs, has been introduced. The adoption of a single channel CODEC together with synchronous multiplex technology allows the PCM MUX to provide a wide range of benefits. Among the features are:

(a) Standardized voice channel unit compatible for all types of equipment.

(b) Economical and flexible implementation of three different types of equipment required for digital networks.

(c) A plug-in type digital access port for new services such as digital data and facsimile.

(d) Remotely controlled channel testing through the on-chip analog loopback circuit.

CSO: 4120/156

BRIEFS

ANTARCTIC RESEARCH EXPEDITION--Tokyo, 16 Feb, KYODO--Japan's 23rd Antarctic Research Wintering Expedition has relieved its predecessor at the Showa Base in the Antarctic, the Education Ministry said here Tuesday. Quoting a report from the base, the ministry said the 34-member 23rd Wintering Expedition started research activities at the Showa Base last Thursday. The icebreaker Fuji has already left the Antarctic for Japan with the previous 34-member 22nd Wintering Expedition aboard. On the way home, the expedition members will conduct a geological survey in Amundsen Bay, the Antarctic. The icebreaker is scheduled to arrive in Port Louis, the capital of Mauritius, on 11 March and in Tokyo on 20 April via Singapore. The expedition members will leave the icebreaker when it arrives in Port Louis and will return home by air in late March. [Text] [OW160955 Tokyo KYODO in English 0937 GMT 16 Feb 82]

CSO: 4120/169

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MARCH 22, 1982